

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**WINDBREAK/SHELTERBELT ESTABLISHMENT**

(Feet)

**CODE 380**

**DEFINITION**

Linear plantings of single or multiple rows of trees or shrubs or sets of linear plantings that are established for environmental reasons.

- To delineate property and field boundaries
- To improve irrigation efficiency.
- To enhance esthetics.

**PURPOSES**

- To reduce soil erosion from wind.
- To protect plants from wind related damage.
- To alter the microenvironment for enhancing plant growth.
- To manage snow deposition.
- To provide shelter for structures, livestock, and recreational areas.
- To enhance wildlife habitat by providing travel corridors.
- To provide a tree or shrub product.
- To provide living noise screens.
- To provide living visual screens.
- To provide living barriers against airborne chemical drift.

**CONDITIONS WHERE PRACTICE APPLIES**

On any areas where linear plantings of woody plants are desired and suited.

**CRITERIA**

**General Criteria Applicable To All Purposes**

The location, layout and density of the planting will accomplish the purpose and function intended within a 20-year period.

The maximum design height (H) for the windbreak or shelterbelt shall be the expected height of the tallest row of trees or shrubs at age 20 for the given site.

The maximum density of a windbreak will not exceed 70% for any purpose.

Extend the length of the windbreak 100 feet beyond the area to be protected for best results.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resource Conservation Service.

Invasive plant species will never be used. Native species will be used as much as possible.

The number of rows and species in each can best be determined on-site. There is no one set design, number of rows, or width of planting that is ideal for every circumstance. Windbreak density depends on plant spacing within the row, number of rows and plant species – shrub, hardwood tree or evergreen tree.

Generally, optimum windrow densities will comply with the following.

<u>Purpose</u>	<u>Density</u>	<u># of Rows</u>
Crop Protection	40-50%	1-2
Snow Distribution	25-30%	1-2
Snow Control	50-60%	1-3
Farmstead Protection	50-60%	3
Livestock/Pasture	50-60%	5

**Spacing Between Rows for Multi-Row Plantings.** The minimum spacing should be 12 feet and the maximum spacing should be approximately 20 feet. Trees with an overtopping crown spread, such as elm and cottonwood, will not be planted within 16 feet of a pine row.

In all cases, the between-the-row spacing will be approximately 4 feet wider than the cultivation equipment to be utilized.

**Row Arrangement for Multi-Row Windbreaks.** Stagger plant locations in adjacent rows. Each row will contain a single species unless a change in soils indicates a need for species change. Low growing shrubs will be planted in the outside row or rows. Most windrows will always have at least 2 rows of evergreen trees and they will be planted in the

outside rows consistent with shrub placement. Where only one row of evergreen trees is included, death losses will be replaced immediately. Tall growing deciduous trees will be planted in the center row or rows in plantings of three or more rows.

Species must be adapted to the soils, climate and site conditions.

Species shall be suited for the planned practice purpose(s).

**Site Preparation.** Site preparation shall be sufficient for establishment and growth of selected species, not contribute to erosion, and be appropriate for the site. Proper site preparation is one of the best ways to improve the survival of your newly planted trees and shrubs. Preliminary ground work reduces competition from weedy species, conserves soil moisture and makes planting easier. All grass and weeds should be eliminated for a minimum of 18 inches from each tree or shrub. Avoid exposing erodible soils to the wind. Prepare the site in the fall prior to planting.

- **Cropland.** Little or no site preparation is necessary on previously cultivated land. If weeds are present, the land may require a single disking before planting. Otherwise, plant directly into the previous year's crop stubble.
- **Pasture or Range.** Prepare site by using approved herbicide in the spring prior to windbreak establishment. Plow, disk or harrow the site in the fall just prior to planting. Where erosion may be a major concern, plant directly into the chemically killed sod. Replanting costs may be incurred since the matted sod, even when the grass is dead, may cause competition for the establishment of the tree roots.

**Adapted Species.**

<u>Species</u>	<u>Mature Height (ft.)</u>	<u>Spacing (ft)</u>		<u>Adaptability</u>
		<u>Within Rows</u>	<u>Between Rows</u>	<u>(MLRA)</u>
SHRUBS				
Honeysuckle 3/	6	4-6	8-16	77,78,80,84,85
Lilac 3/	8	4-6	8-16	77,78,80,84,85
Native plum (Rainbow) 2/ 3/	8	4-6	8-16	77
Oleander 3/	8	4-6	8-16	83, 150
Pyracantha 3/	10	4-6	8-16	ALL
Sand cherry 2/ 3/	4	4-6	8-16	77,78,80,84,85
Skunkbush sumac 3/	6	4-6	8-16	77,78,80,84
Winterberry eaunymous 3/	10	4-6	8-16	ALL
Yaupon 3/	15	4-6	8-16	83,87,150
DECIDUOUS TREES				
American plum 2/ 3/	15	6-12	10-20	77,78,80
Apricot 3/	15	6-12	10-20	77,78,80
Black walnut	60	15-20	15-30	78,80,84
Bur oak 3/	40	10-20	15-25	77,78,80,84
Catalpa	25	10-20	15-25	78,84,85
Cottonwood 1/	60	10-20	15-25	78,80,84,85
Desert willow	20	6-12	10-20	42,77,78,80,81
Eucalyptus 3/	50	10-20	15-25	83,150
Flameleaf sumac 3/	20	6-12	10-20	42,77,78,80,81,84,85
Green ash	30	10-20	15-25	77,78,80,85
Hackberry 2/ 3/	40	10-20	15-25	77,78,80,84,85
Honeylocust	40	10-20	15-25	ALL
Lacebark elm	40	10-20	15-25	ALL
Little walnut	30	10-20	15-25	77-78,80-81,84-87
Osage-orange 3/	30	10-20	15-25	ALL
Pecan 3/	60	10-20	15-30	77,78,80,84
Redbud 3/	20	6-12	10-20	77,78,80,84,85
Red mulberry 3/	35	10-20	15-25	77 (S. of Amarillo),78,80,85

**Adapted Species - continued**

<u>Species</u>	<u>Mature Height (ft.)</u>	<u>Spacing (ft)</u>		<u>Adaptability</u>
		<u>Within Rows</u>	<u>Between Rows</u>	<u>(MLRA)</u>
DECIDUOUS TREES-cont.				
Shumard oak 3/	30	10-20	15-25	77,78,80,84,85,86
Sycamore 1/ 2/	40	10-20	15-25	77,78,80,84,85
EVERGREEN TREES				
Afghanistan pine	35	10-15	10-20	42,77(S. of Tulia) 78,80,81,83
Aleppo pine	30	10-15	10-20	83,150
Arizona cypress	30	10-15	10-20	ALL (except N. of Amarillo)
Austrian pine	40	10-20	15-30	77
Eastern redcedar	30	10-15	10-20	ALL
Keteleari juniper	20	10-15	15-20	ALL
Loblolly pine	80	10-20	15-30	78,80,84,85
Oriental arborvitae	25	10-15	10-20	ALL
Ponderosa pine	40	10-20	15-30	42,77,78,80
Rocky Mountain juniper	30	10-15	10-20	42,77,78
Scotch pine	30	10-15	10-20	77(N. of Lubbock)
Slash pine	40	10-20	15-30	80,84,85

Most species are better suited to loamy or sandy soils. Need to evaluate all factors carefully before planting on heavy clay soils.

- 1/ Needs sites with high water table
- 2/ Needs sandier sites or sites receiving extra water
- 3/ Species useful to wildlife for food and/or cover

**Planting.** Only viable, high quality, and adapted planting stock or seed will be used. Select species from NRCS Field Office Technical Guide and Tree/Shrub Establishment standard (612).

Planting may occur in a “V”-ditch that is no more than 6-inches deep. Trees will be planted at the bottom of the “V”.

Polypropylene woven fabric or organic mulches may be used as a weed barrier in lieu of

cultivation or herbicides. Use of the fabric is highly desirable when watering by drip irrigation is not practical. Minimum width of the fabric will be 6 feet. The fabric will be a minimum thickness of 6ml and will have a minimum 5-year guarantee against deterioration by sunlight. Pull trees and shrubs through openings cut in the fabric at the plant location. Openings will be two cuts made to form a cross and will be the minimum size to pull the plant through. The fabric is to lay flat over the soil with the edges secured by covering with soil or stapling.

The planting shall be done at a time and manner to insure survival and growth of selected species. Bare-rooted seedlings will be planted no later than 2 weeks after the last frost. Containerized seedlings will be planted before June 1 north of I-20 and by May 1 south of I-20.

Care should be taken to avoid creating blind corners with windbreaks at road intersections.

Protect the planting from damage by livestock and fire. Refer to Use Exclusion standard (472) and Firebreak standard (394).

Avoid planting trees or shrubs where they will interfere with structures and above or below ground utilities.

Moisture conservation or supplemental watering shall be provided for plant establishment and growth where natural precipitation is too low for the selected species. Supplemental water will be planned in areas of less than 25 inches of annual rainfall.

Comply with applicable laws and regulations, including the Texas Best Management Practices for Silviculture (BMPs).

### **Additional Criteria To Reduce Wind Erosion; Protect Growing Plants**

The windbreak will be oriented as close to perpendicular to the troublesome wind as possible. The interval between windbreaks shall be determined using current, approved, wind erosion technology. Interval widths shall not exceed that permitted by the soil loss tolerance (T), or other planned soil loss objective. Calculations shall account for the effects of other practices in the conservation management system.

Plants are protected within an area 10 times the design height (H) on the leeward side and two times the design height (H) on the windward side of the windbreak.

Rarely will field windbreaks composed of trees and shrubs be the sole method of protection soils from blowing. Field windbreaks are usually a component of a wind erosion control system, such as crop residue use, herbaceous wind barriers, cross wind ridges, cross wind strip cropping, cross wind trap strips and proper tillage.

Where a high degree of protection from blowing soil or crop damage is needed or desired, spacing intervals will be determined by using current soil erosion estimation methods (i.e. WEQ or WEEP).

The wind erosion control system should consider temporary measures to supplement the windbreak until it is fully functional.

### **Additional Criteria To Manage Snow**

The windbreak will be oriented as close to perpendicular to the snow-bearing wind as possible.

For snow distribution across a field, the minimum windbreak density will be 25 percent and the maximum windbreak density will be 65 percent. The interval between barriers will not exceed 20H.

For snow accumulation, the minimum barrier density will be 50 percent and the windward row will be a minimum of 100 feet from the area to be protected.

The windbreak row of a living snow fence shall be a minimum of 200 feet from the centerline of the road. Where snow drifting may be a problem on farmsteads and feedlots, the windward row of the living snow fence should be placed a minimum of 100 feet from the area to be protected.

Windbreaks will be located so that snow deposition will not adversely impact the area to be protected.

Where water erosion and/or runoff from melting snow is a hazard, it shall be controlled by supporting practices.

### **Additional Criteria To Provide Shelter For Structures, Livestock, and Recreational Areas**

In addition to the above benefits, farmstead windbreaks can provide energy conservation, improved living and working environments and wildlife habitat. Well-designed farm windbreaks can cut energy costs as much as 40 percent.

The planting will be oriented as close to perpendicular to the troublesome wind as possible.

For wind protection, the minimum barrier density will be 65 percent and the area to be protected will fall within 10H. Ideally, the windbreak row with the tallest tree species

should be approximately 2-5H from all primary objects or areas needing protection.

Windbreak plantings in the north and west sides of farmstead should contain at least one row of evergreen trees.

In windrow plantings that exceed 2 rows, it is permissible to leave gaps in row 3 and beyond to enhance beautification and wildlife values. When species are mixed, a minimum of 5 plants of each species should be planted in succession. It is also permissible to leave gaps in row 3 and beyond to create an irregular edge. Refer to Upland Wildlife Habitat Management (645).

Drainage of snowmelt from the windbreak shall not flow across the livestock area.

Drainage of livestock waste from the livestock area shall not flow into the windbreak.

### **Additional Criteria For Screens**

Noise screens shall be at least 65 percent dense, as tall as, and as close to the noise source as practicable.

The length of the noise screen should be twice as long as the distance from the noise source to the receiver.

For high-speed traffic noise, the barrier needs to be 65 to 100 feet wide. For moderate speed traffic noise, the barrier width can be 20 to 25 feet.

Species selected will be tolerant to noxious emission and sand or salt spray in traffic areas.

Visual screens shall be located as close to the observer as possible.

### **Additional Criteria For Providing or Enhancing Wildlife Habitat or Travel Corridors.**

Plant species selection shall benefit targeted wildlife species.

Design dimensions of the planting shall be adequate for targeted wildlife species. Refer to Upland Wildlife Habitat Management (645).

### **Additional Criteria To Enhance Aesthetics**

To enhance aesthetics use evergreen species or species with features such as showy flowers, brilliant fall foliage, or persistent colorful fruits.

## **CONSIDERATIONS**

Spacing between windbreaks and rows of windbreaks may be adjusted, within limits of the criteria above, to accommodate widths of equipment.

To enhance aesthetics use evergreen species or species with features such as showy flowers, brilliant fall foliage, or persistent colorful fruits.

Selection of plants for use in windbreaks should favor species or varieties tolerant to herbicides used in the area.

Plants that may be alternate hosts to undesirable pests should be avoided.

All plantings should complement natural features.

Tree or shrub rows should be oriented on or near the contour where water erosion is a concern. Where water erosion and/or runoff from melting snow is a hazard, it should be controlled by supporting practices.

Wildlife should be considered when selecting tree or shrub species. Species diversity should be considered to avoid loss of function due to species-specific pests.

Consideration should be given to adverse offsite effects.

Plants established in cropping systems should have root systems that do not affect crop growth and/or spread from root sprouts.

## **PLANS AND SPECIFICATIONS**

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation. The Windbreak/Shelterbelt Conservation Practice Job Sheet (380), April 1997, may be used for planning purposes.

## **OPERATION AND MAINTENANCE**

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance):

Replacement of dead trees or shrubs will be continued until the barrier is functional.

Moisture conservation or supplemental water will be provided as needed.

The installation of a drip irrigation system is very helpful, but is not required. A drip system will help insure seedling survival and will provide supplemental water during the entire

establishment period. If installed, the emitter will be placed within 12 inches of each plant. The system will have a minimum capacity of 8 gallons per plant per week. The first watering in the spring after the last frost and the last watering before the first frost are important to maintain plant vigor through dormancy. See Irrigation (441) standard.

Protect newly planted evergreens from damaging wind for at least the first growing season.

Protect newly planted hardwood seedlings from rodent damage until they are well established.

Competition from weeds is the leading cause for failure of newly planted windbreaks. Control weedy competition using mechanical methods or approved chemicals applied according to label instructions.

The trees and shrubs will be inspected periodically and protected from adverse impacts including insects, diseases or competing vegetation. Livestock will be excluded from windbreaks (Use Exclusion – 472). The trees or shrubs will also be protected from fire and from damage by wildlife.

Periodic applications of nutrients may be needed to maintain plant vigor.

Occasional root prunings may be necessary when windbreaks are planted adjacent to cropland fields. Do not begin pruning until trees in the windbreaks are well established.

## REFERENCES

Planning Farm Shelterbelts. PFRA Shelterbelt Publications.

<http://www.agr.ca/pfra/shbpub/shbpub24.htm>

What is a Windbreak? Texas Forest Service.

<http://Txforests-service.tamu.edu/tfshome/aboutus/wtnfol/what.htm>

Windbreak Establishment by Patricia Bohner, James R. Brandle and Sherman Finch. 6 pages.

<http://www.unl.edu/nac/pubs/ec/ec1764/>

Windbreaks for Rural Living. Bruce Wight, Teresa Boes and James R. Brandle. 7 pages.

<http://www.unl.edu/nac/pubs/ec/ec1767/>

Windbreaks for Snow Management. James R. Brandle and H. Doak Nickerson. 6 pages.

<http://www.unl.edu/nac/pubs/ec/ec1770/>

Windbreaks in Sustainable Agricultural Systems. Vernon Quam, Jon Gardner and James R. Brandle. 6 pages.

<http://www.unl.edu/nac/pubs/ec/ec1772/>

Windbreak/Shelterbelt Conservation Practice Job Sheet. USDA-NRCS. 4 pages



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**APPROVAL AND CERTIFICATION**

**WINDBREAK/SHELTERBELT ESTABLISHMENT**

**(Feet)**

**CODE 380**

PRACTICE STANDARD APPROVED:

\_\_\_\_\_  
/s Susan Baggett  
(State Forester)

\_\_\_\_\_  
June 1, 2000  
(Date)

This practice standard is needed in the \_\_\_\_\_ Field Office  
Technical Guide.

\_\_\_\_\_  
(RTL/DC)

\_\_\_\_\_  
(Date)

**CERTIFICATION:**

Reviewed and determined adequate without need of revision.

\_\_\_\_\_  
(Zone Specialist)

\_\_\_\_\_  
(Date)